Health Consultation

Bobbie's Flower Basket
Port Angeles, Clallam County, Washington

October 26, 2001

Prepared by

The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond quickly to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

For additional information or questions regarding DOH, ATSDR or the contents of this Health Consultation, please call the health advisor who prepared this document:

Paul Marchant
Washington State Department of Health
Office of Environmental Health Assessments
P.O. Box 47846
Olympia, WA 98504-7846
(360) 236-3375
FAX (360) 236-3383
1-877-485-7316
Web site: www.doh.wa.gov/ehp/oehas/default.htm

Glossary

Acute	Occurring over a short period of time. An acute exposure is one which lasts for less than 2 weeks.
Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Carcinogen	Any substance that can cause or contribute to the production of cancer.
Chronic	A long period of time. A chronic exposure is one which lasts for a year or longer.
Comparison value	A concentration of a chemical in soil, air or water that, if exceeded, requires further evaluation as a contaminant of potential health concern. The terms comparison value and screening level are often used synonymously.
Contaminant	Any chemical that exists in the environment or living organisms that is not normally found there.
Dose	A dose is the amount of a substance that gets into the body through ingestion, skin absorption or inhalation. It is calculated per kilogram of body weight per day.
Environmental Media Evaluation Guide (EMEG)	A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a *comparison value* used to select contaminants of potential health concern and is based on ATSDR's *minimal risk level* (MRL).

Exposure	Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short-term (acute) or long-term (chronic).
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Media	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.
Minimal Risk Level (MRL)	An amount of chemical that gets into the body (i.e., dose) below which health effects are not expected. MRLs are derived by ATSDR for acute, intermediate, and chronic duration exposures by the inhalation and oral routes.
No apparent public health hazard	Sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.
Organic	Compounds composed of carbon, including materials such as solvents, oils, and pesticides which are not easily dissolved in water.
Parts per billion (ppb)/Parts per million (ppm)	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE.
Permissable Exposure Limit	A Permissible Exposure Limit (PEL) is the maximum amount or concentration of a chemical that a worker may be exposed to under Occupational Safety and Health (OSHA) regulations.

U.S. Environmental Protection Agency (EPA)	Established in 1970 to bring together parts of various government agencies involved with the control of pollution.
Volatile organic compound (VOC)	An organic (carbon-containing) compound that evaporates (volatilizes) easily at room temperature. A significant number of the VOCs are commonly used as solvents.

Background and Statement of Issues

This health consultation was prepared at the request of the Clallam County Department of Community Development (Clallam County) to evaluate the results of air samples collected at Bobbie's Flower Basket (BFB), a retail business located at 125 West 1st Street, in Port Angeles, Washington (Figure 1). The air samples were collected by the City of Port Angeles (city) and the Washington State Department of Labor and Industries (L&I) between late March and early April 2001 in response to odor and irritation complaints expressed by BFB owners and employees.

BFB is a small retail flower shop located in downtown Port Angeles (Figure 2). Adjacent properties are primarily other small retail businesses. The property evaluated includes the flower shop, a basement area, an adjacent work room, and a street level walkway above the basement (Figures 3,4,6,7). BFB staff includes the shop owners (husband and wife) and until recently, several shop employees. The shop property is owned by an absentee landlord. The walkway is owned by the city.

Site History/Sampling Activities

In the mid 1960s, the city constructed what is now a pedestrian walkway above the BFB basement. As a sealant, tar was applied to the four foot by twelve foot timbers which formed the base of the walkway. Concrete was then placed on top of the tar.

Bobbie's Flower Basket, the current business, has operated since the early 1990s. In December 1999, BFB staff observed water leaking from the ceiling onto the basement floor. Shortly thereafter, the ceiling drywall and sheet plastic were removed, exposing a tarry material (Figure 4). Tar was found between the joints and ends of the wood decking at various places beneath the walkway and on the basement floor below the walkway (Figure 5).

On December 21, 1999, the city collected a sample of the black tarry material from underneath the walkway in the basement room. The sample was submitted to Professional Service Industries (PSI) for analysis. The analysis indicated that the sample was a petroleum hydrocarbon-based tar, and that cresote and chlorinated phenyls were not present. PSI concluded that the tarry substance did not pose a significant health hazard. In late December 1999, or January 2000, the

city conducted a second site visit to determine the thickness of the walkway concrete slab. Two holes were drilled, revealing a thickness between 2.5 and 3.5 inches.

On February 6, 2001, the Washington State Department of Ecology (Ecology) collected tar samples to evaluate levels of polynuclear aromatic hydrocarbons (PAHs). The samples were submitted to Manchester Laboratory for analysis. Results of the analysis revealed high levels (approaching percent levels) of PAHs, including pentachlorophenol (PCP). For example, PCP was detected as high as 13,400 parts per million (ppm) in the tar.

On March 27, 2001, the city Fire Department collected air samples in the basement using a methane/oxygen/toxic gas detector. Nothing was detected during this event. The following day (March 28) an Industrial Hygiene consultant from L&I collected air samples from the main flower shop work area, shop office, basement stairs, and basement storage area underneath the treated timbers. The samples were collected over an approximately two to four hour period using a Gillian low-flow pump and charcoal tubes, and analyzed for organics, asphalt, cresols, and PCP. Analysis revealed no detectable organic chemicals, although L&I recommended that the treated timbers either be encapsulated or removed to eliminate the odors.

As a result of continued odor and irritation complaints by BFB owners and employees, the city hired a consultant to conduct additional air sampling. Air samples were collected on April 2 in the basement, the adjacent work room, and upstairs in the flower shop to identify and measure the levels of PAHs (OSHA method #58), PCP (OSHA method #39), and solvents (OSHA method #7). A photoionization detector (PID) was also used to measure the levels of total organics. Results of the analysis revealed low levels of toluene, limonene, petroleum distillates, acetone, and naphtha (coal tar) (Table 1). The city's consultants concluded that the detected chemicals were below levels of health concern, but recommended encapsulation or removal of the tarry material as a permanent remedy.

In the spring of 2001, a fan and vent system was installed to ventilate the basement area. Continued BFB staff odor complaints resulted in the vent stack height being raised in an effort to more effectively disperse the fumes.

On July 27, 2001, DOH visited the site and met with the owners. During the site visit, DOH noted that most of the exposed tarry material underneath the walkway in the basement had been removed and that the basement walls and ceiling had been painted over (Figure 7). A small amount of tar was still visible underneath the ceiling timbers and on the basement floor. The owners claim they can still smell chemical odors, and that several employees recently quit as a result of the odors. The owners also indicated that odors from the tarry material had permeated some of their personal property stored in the basement.

Discussion

Low levels of several chemicals and chemical mixtures were detected in air during the most recent (April 2001) sampling event at BFB. Naptha (coal tar) and petroleum distillates were detected in all three rooms sampled. In addition, toluene and limonene were detected in two of the rooms, and acetone was detected in one room (Table 1). Numerous individual polynuclear aromatic hydrocarbons (PA's) were analyzed, but not detected. Pentachlorophenol was not detected, although the analytical detection limit was higher than its corresponding health comparison value.

All toluene and acetone detections were below respective Agency for Toxic Substances and Disease Registry (ATSDR) health-based comparison values. ATSDR comparison values are media-specific concentrations used to select environmental contaminants for further evaluation. Contaminant concentrations below these values are unlikely to pose a health threat, and were not further evaluated in this health consultation.

Since there are no published ATSDR or EPA health comparison values for limonene, coal tar/naptha, and petroleum distillates, the scientific literature was reviewed to evaluate potential health effects from exposure to these compounds. In addition, workplace exposure levels were evaluated to assess potential health effects from exposure to these compounds. The references are listed at the end of this report.

Limonene

d-Limonene (1-methyl-4-isopropenyl-1-cyclohexene) is a liquid with a lemonlike odor. It is a major constituent in several citrus oils (orange, lemon, mandarin, lime, and grapefruit) and is present in a number of other essential oils. d-Limonene is used primarily as a flavor and fragrance ingredient. It is included on the Food and Drug Administration's (FDA's) Generally Recognized as Safe (GRAS) list, and is approved for use by the FDA as a food additive. It has also been used as a solvent and water soluble cleaning product.

Exposure to limonene in indoor and outdoor air is common due to its release from natural sources and its presence in household products. Limonene is also found in some foods.

No data were available regarding the ability of d-limonene to cause cancer. The International Agency for Research on Cancer (IARC) considers d-Limonene not classifiable as to its carcinogenicity (Group 3).

No information is available on the health effects of inhalation exposure to d-limonene in humans, and no long-term inhalation studies have been conducted on laboratory animals. An EPA reference Concentration (RfC) has not been derived because of the lack of information on possible respiratory tract effects and the limited data on which to base a route extrapolation. Exposure to high levels in air is believed to result in nose, throat, and respiratory tract irritation, coughing and headache.

In 1990, the National Toxicology Program (NTP) conducted a series of studies that investigated the toxicity of d-limonene (>99% pure) administered to rats and mice. At very high doses, decreased body weight gain was observed. The only compound-related toxicity observed were kidney effects in the male rats, although other factors may have been responsible for these effects.

Estimated inhalation exposures at BFB are well below doses at which adverse health effects were observed in the laboratory studies. In addition, air concentrations at BFB were about 10,000 times lower than the allowable occupational exposure level (Table 1). As a result, adverse health effects would not be expected from exposure.

Naptha (coal tar)

Coal tar is the product of the destructive distillation of bituminous coal. Coal tar can be distilled into many fractions to yield a number of chemicals, including benzene, toluene, xylene, naphthalene, anthracene, phenanthrene, naphtha, creosote, carbolic oil, cresol, and phenol, among others. These substances, referred to as coal-tar crudes, form the starting point for the synthesis of numerous products, such as dyes, drugs, explosives, flavorings, perfumes, preservatives, synthetic resins, and paints and stains. The residual pitch left from the fractional distillation is used for paving, roofing, waterproofing, and insulation.

Volatile fumes, called coal tar pitch volatiles, are emitted when coal tar, coal tar pitch, or their products, are heated. They contain lower molecular-weight PAHs such as naphthalene, fluorene, anthracene, acridine, and phenanthrene, and higher molecular-weight PAHs, such as benzo(1)-pyrene, benzo(a)-anthracene, benzo(j)-fluoranthrene, chrysene, and dibenz(a,b)-anthracene. Many of the higher molecular-weight PAHs are known or suspected human carcinogens.

Studies of coke oven workers exposed to coal tar pitch volatiles in the workplace, have shown an increased risk of mortality from cancer of the lung, trachea and bronchus; cancer of the kidney; cancer of the prostate; and cancer at all sites combined. These studies strongly suggest that coke oven emissions (hence coal tar pitch volatiles), are human carcinogens. In animals, extracts and condensates of coke oven emissions were found to be carcinogenic in both inhalation and skin contact studies. The EPA considers coal tar pitch volatiles Class A carcinogens, based on sufficient human and animal studies. Cardiovascular system and respiratory system effects are also considered potential responses to exposures to coal tar naphtha.
Levels of coal tar detected in air at BFB were at or slightly above OSHA Permissible Exposure Limits (Table 1). However, since levels of individual PAHs analyzed were very low (below laboratory detection limits), exposures likely do not pose a health hazard.

Petroleum Distillates

The levels of petroleum distillates measured in BFB were from 1,700 to 5,000 times below the OSHA Permissible Exposure Limit. Additionally, levels of individual chemicals (VOCs and

PAHs) measured were either low, or not-detected, suggesting that adverse health effects would not be expected.

Like coal tar pitch volatiles, petroleum distillates are mixtures of many different chemicals. General health effects from exposure to high levels in air include peripheral nerve disorders, central nervous system (CNS) depression, and skin and respiratory irritation.

Workers exposed to occupational levels of mixtures of solvents, including petroleum distillates, reported CNS symptoms, including headache, fatigue, poor concentration, impaired memory, and impaired psychomotor performance. Some of these were reported to be short- or mid-term effects, while others were more persistent. Dose-response relationships were frequently observed; the longer and more intense the exposures, the longer and more acute the symptoms.

Exposures to high concentrations of petroleum distillates in air have also been reported to result in irritation of the mucous membranes and respiratory tract, and can produce headache, dizziness, nausea, and shortness of breath. Dermal (skin) contact to vapors or liquids containing high levels of petroleum distillates can produce dermatitis.

Child Health Initiative

ATSDR's Child Health Initiative recognizes that the unique vulnerabilities of infants and children deserve special emphasis with regard to exposures to environmental contaminants. Infants, young children, and the unborn may be at greater risk than adults from exposure to particular contaminants. Exposure during key periods of growth and development may lead to malformation of organs (teratogenesis), disruption of function, and even premature death. In certain instances, maternal exposure, via the placenta, could adversely effect the fetus. After birth, children may receive greater exposures to environmental contaminants than adults. Children are often more likely to be exposed to contaminants from playing outdoors, ingesting food that has come into contact with hazardous substances, or breathing soil and dust. Pound for pound body weight, children drink more water, eat more food, and breathe more air than adults. For example, in the United States, children in the first six months of life drink seven times as much water per pound as the average adult. The implication for environmental health is that, by virtue of children's lower body weight, given the same exposures, they can receive significantly higher relative contaminant doses than adults.

DOH evaluated the likelihood of adverse health effects for infants or young children assumed to be exposed to the contaminants evaluated in the health consultation. No adverse developmental or reproductive health effects would be expected for children assumed to be exposed to the detected contaminants.

Conclusions

1. Low levels of several chemicals and chemical mixtures were detected in the air in one or more of the rooms tested at BFB during the April 2001 sampling event.

2. Toluene and acetone concentrations were below respective health comparison values, and do not pose a health hazard.

3. Naptha and petroleum distillates were detected at low levels in all three rooms tested, and limonene was detected in two of the rooms tested. Based on DOH's review of the scientific literature, the levels detected are unlikely to pose a health hazard.

4. Individual polynuclear aromatic hydrocarbons (PAHs) were not detected above the analytical detection limit in any of the air samples.

5. Pentachlorophenol was not detected above the analytical detection limit, although the detection limit was higher than the respective health comparison level for PCP.

6. Based on the results of air samples collected at BFB which were evaluated in this health consultation, no apparent public health hazard exists.

Recommendations/Action Plan

1. The City of Port Angeles is currently preparing a workplan which will address encapsulation of the walkway above the BFB basement. The encapsulation is anticipated to occur in September 2001.

2. Follow-up air sampling should be conducted after encapsulation to measure the levels in air, if any, of PCP. The air samples should be analyzed using a test method appropriate for the evaluation of human health. DOH is available to assist with the development of such a plan. If follow-up sampling is done, the results should be provided to DOH for evaluation.

3. Copies of this health consultation will be provided to the owners and employees of Bobbie's Flower Basket, Clallam County, Puget Sound Clean Air Agency, the Washington State Department of Labor and Industries, and the Washington State Department of Ecology. Upon request, additional copies of this health consultation are available.

Preparer of Report
Paul Marchant
Site Assessment Section
Washington State Department of Health
Office of Environmental Health Assessments

Designated Reviewer
Rob Duff, Manager
Site Assessment Section
Washington State Department of Health
Office of Environmental Health Assessments

Technical Project Officer
Debrah Gable
ATSDR

References

1. Professional Service Industries: Letter to Tracy Gudgel, Zenovic & Associates. Laboratory Characterization of Unknown Black Substance. February 9, 2000.

2. Zenovic & Associates, Inc. Letter to Ron Johnson, City of Port Angeles Engineering Department. First Street Walkway between Oak Street and Laurel Street. February 10, 2000.

3. Manchester Environmental Laboratory. Department of Ecology Analysis Report for Polyaromatic Hydrocarbons. March 13, 2002.

4. City of Port Angeles Fire Department: Memo to Gary Kenworthy, City Engineer re: Bobbie's Flower Basket. March 27, 2001.

5. McConnell and Associates, Inc. Letter to Peter Batuello, Parametrix, Inc. re: Air Sampling Plan for Bobbie's Flower Basket. April 10, 2001.

6. Wisconsin Occupational Health Laboratory. Analytical Results for Air Samples collected at Bobbie's Flower Basket. April 6-13, 2001.

7. McConnell and Associates, Inc. Bobbie's Flower Basket Industrial Hygiene Report: Sampling for PAHs, Pentachlorophenol, and Solvent Screening. April 25, 2001.

8. Parametrix, Inc. Letter to Ron Johnson, City of Port Angeles re: the findings of the air sampling conducted at 125 West 1st Street, Port Angeles, Washington. April 26, 2001.

9. City of Port Angeles, Public Works & Utilities Department. Letter re: Air Sampling Results, Bobbie's Flower Basket. May 10, 2001.

10. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS), August 2001 update.

11. Personal communication with Ron Johnson, City of Port Angeles Public Works, July 2001.

12. Personal communication with Peter Batuello, Parametrix, July 19, 2001.

13. Personal communication with Bobbie and Earl Brown, Bobbie's Flower Basket. July 27, 2001.

14. Agency for Toxic Substances and Disease Registry, Division of Health Assessments and Consultations. Air Comparison Values. June 30, 2001 update.

15. Washington State Department of Labor and Industries. Consultation Report for Bobbie's Flower Basket. April 30, 2001.

16. Hazardous Substance Databank.

17. Florida Chemical Company, Inc. Material Safety Data Sheet: d-Limonene. August 15, 2000.

Table 1
April 2, 2001 Bobbie's Flower Basket Air Sampling Results and Corresponding Health Comparison Values
(concentrations are in parts per billion (ppb)

Location	Analyte Detected	Concentration (ppb)	Health Comparison Value	Cancer Class
Basement Store Room	Toluene	4	80 (chronic EMEG)	EPA Class D (not classified)
	Limonene	4	30,000 (WEEL)	IARC Group 3 (not classifiable)
	Petroleum Distillates	26	400,000 (ACGIH 8-hour TLV); 100,000 (OSHA PEL)	
	Naptha (Coal Tar)	380 (1.8 mg/m3)	0.2 mg/m3 (OSHA PEL; Coal tar pitch volatiles, as benzene solubles)	EPA Class A (Human carcinogen)
Retail Flower Shop Work Area	Acetone	42	13,000 (chronic EMEG)	NTP Class 3 (not classified)
	Toluene	7	80 (chronic EMEG)	EPA Class D (not classified)
	Limonene	3	30,000 (WEEL)	IARC Group 3
	Petroleum Distillates	59	400,000 (ACGIH 8-hour TLV); 100,000 (OSHA PEL)	
	Naptha (Coal Tar)	100 (0.5 mg/m3)	0.2 mg/m3 (OSHA PEL; Coal tar pitch volatiles)	EPA Class A (Human carcinogen)
Basement Work Room	Petroleum Distillates	20	400,000 (ACGIH 8-hour TLV); 100,000 (OSHA PEL)	
	Naptha (Coal Tar)	39	0.2 mg/m3 (OSHA PEL; Coal tar pitch volatiles)	EPA Class A (Human carcinogen)

EMEG: ATSDR chronic Environmental Media Evaluation Guide
WEEL: Workplace Environmental Exposure Level: 8-hr Time-weighted Average (TWA)
OSHA PEL: Occupational Safety and Health Administration Permissable Exposure Limit
ACGIH TLV: American Conference of Governmental Industrial Hygienists

Appendix A
Figures

Certification

This Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Debra Gable
Technical Project Officer, SPS, SSAB, DHAC
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

Richard Gillig
Chief, SPS, SSAB, DHAC
ATSDR